

In-Office Cost System (IOCS) Documentation

I. PREFACE

A. Purpose and Content

USPS-FY16-37 documents the In-Office Cost System, including statistical design for and estimation of in-office labor costs. It also presents FY16 CVs and confidence intervals for the estimates.

B. Predecessor Document

Documentation of statistical design and estimation were provided previously in Docket No. R2006-1, USPS-LR-L-9 and ACR2015, USPS-FY15-37.

C. Corresponding Non-Public Document

USPS-FY16-NP21, In-Office Cost System (IOCS) Documentation.

D. Methodology

For FY16, IOCS methodology is the same as described in Docket ACR2015: USPS-FY15-37, except for the changes listed below.

Effective May 31, 2015, FSS-specific prices became part of the Standard Regular product rather than ECR, and therefore FSS costs are no longer split using PostalOne data.

Effective on May 31, 2015, USPS Tracking became a free Extra Service for retail First-Class Mail Parcels and Media Mail. Therefore, there is no longer an adjustment using POS data to shift window acceptance costs to USPS Tracking.

Changes have been made to the production programs to reflect Order No. 2387 (Nov. 24, 2015), Proposal Ten in Docket RM2015-19. A new variable, RPT_CAG, has been added to the IOCS dataset to enable separate reporting of CAG K and L offices from the CAG H and J offices that are in the same strata.

Changes have also been made to reflect Order No. 3519 (Sep 16, 2016), Docket No. CP2016-261 (Global Expedited Package Services 6). Certain international sacks that were formerly identified as mixed mail are now identified as IPA or ISAL sacks and costs are assigned to the IPA or ISAL product respectively. .

After investigation into an anomaly in the costs of First-Class Presort Flats and First-Class Single Piece flats¹, a coding error in IOCS data processing was identified and corrected, leading to a shift in costs from First-Class Presort to First-Class Single Piece for both letters and flats.

¹ Responses of the United States Postal Service to Question 4 of Docket No. ACR FY2015, Chairman's Information Request No. 16, question 4, February 29, 2016.

E. Input/Output

Cost estimates from the In-Office Cost System rely on no input data. Outputs from the In-Office Cost System are used as inputs to:

USPS-FY16-1	• FY 2016 Public Cost and Revenue Analysis (PCRA) Report
USPS-FY16-7	• Cost Segment 3 Cost Pools & Other Related Information (Public Portion)
USPS-FY16-19	• FY2016 Delivery Costs by Shape
USPS-FY16-31	• FY 2016 CRA Model (Model Files, Cost Matrices, and Reports) (Public Version)
USPS-FY16-32	• FY 2016 CRA "B" Workpapers (Public Version)

II. ORGANIZATION

This document describes the statistical design of IOCS, and provides information on the system's programs. Electronic data files, programs, data dictionary, flowchart and CVs are provided in the accompanying CD, described in Appendix A.

III. OVERVIEW

The In-Office Cost System (IOCS) is a continuous, ongoing probability sample of work time to estimate costs of various activities performed by clerks, mail handlers, city carriers, and supervisors. Although the Postal Accounting system tracks costs for various categories of employees, it does not identify labor costs by product because employees are simultaneously processing more than one product in most operations. The IOCS is designed to supplement the accounting system data by sampling employees at randomly selected points in time throughout the year. When an employee is sampled, the activity of the employee at that point in time is recorded directly into a laptop computer using the IOCS Computerized On-Site Data Entry System (IOCS-CODES) software.

These sample data, in combination with data from the accounting system and the MODS system, are used to produce detailed estimates of attributable costs for various activities.

A. Use of IOCS Data in Distribution of Costs to Mail Categories

IOCS estimates are used to distribute volume variable costs to products for cost segments 3 (clerk/mail handler-CAG A-L Post Offices) and 6 (city carrier, in-office). The data are generally tabulated at the "cost pool" level for costing purposes; see USPS-FY16-7.

B. Other Uses of IOCS Data for Costing

Cost estimates from the IOCS are also used to develop accrued costs for segment 2 (supervision of mail processing, window service, admin support...), segment 6 (city carrier in-office), and segment 7 (city carrier street time). For example, the accounting system provides total accrued costs of city carriers (Cost Segments 6 and 7 combined),

and an IOCS estimate of the proportion of city carrier cost while in the office is used to split accrued costs between segments 6 and 7.

In addition, the distribution of volume variable costs in other segments and components relies indirectly on IOCS. For example, volume variable rental costs for window service space are distributed as window service in segment 3.2, and the volume variable costs of segment 3.2 are distributed to products based on IOCS estimates.

Documentation for the In-Office Cost System provided in USPS-LR-L-9, Docket No. R2006, included complete programs and descriptions of field data collection processes and data editing. Those programs and descriptions have incurred no substantive changes and are not reproduced herein.

IV. STATISTICAL STUDY DESIGN

The universe under study in IOCS consists of all the work time, during a Fiscal Year, of all employees in four employee crafts: 1) Clerks, 2) Mail Handlers, 3) City Carriers, and 4) Supervisors.² The IOCS is a three-stage probability sample of employee work time, stratified by employee craft and by Cost Ascertainment Group (CAG). The details for each of the stages are described below:

A. First Stage Sample

The first stage sampling unit is a finance number, or post office. The IOCS office frame consists of all finance numbers which contain employees eligible for sampling in IOCS. Finance numbers are stratified by size into CAGs, where the measure of size for each office is its total revenue receipts two years previous. The office frame consists of finance numbers whose CAG status is at K or above. The Network Distribution Centers (NDC) and processing and distribution facilities (P&DC, AMC, AMF and some P&DF) are considered as part of the stratum of largest (CAG A and B) offices.

All offices that were in CAG A or CAG B prior to 1992 and remained in CAGs A or B are included in the sample. In each of the other CAGs a panel of offices is used to represent the office frame.

² This group includes professional, administrative and technical staff.

Table 1 summarizes the first-stage sample and universe sizes.

Table 1: CAG Group and CAG Fiscal Year 2016 First-Stage Universe Sample		
CAG Group	Office Frame	Sampled Offices
A/B	2,773	2,551
C	1,348	410
D	809	123
E	1,589	85
F	2,200	65
G	3,177	111
H/J	7,869	180
K/L	6,077	5
Grand Total	25,842	3,530

B. Second Stage Sample

The second stage sampling unit is the employee-week. Employees are stratified by craft within CAG. Sampling rates are specific to craft-CAG combinations. In order to generate more accurate cost estimates for international products, clerks and mail handlers in offices with high volumes of international mail are sampled at higher rates. Within each office, a higher sampling rate is assigned to a group of pay locations with a historically higher incidence of handling international mail. For these offices, the weekly employee sampling rates ranged from 0.03 to 0.50, as compared to the default rate of 0.03 for CAG A clerks and mail handlers.

Table 2 summarizes the employee sampling rates and Table 3 shows the sample sizes by craft and CAG group.

Table 2
Employee Sampling Rates by CAG and Employee Craft

CAG	Clerk - Regular	Clerk - Other	Mail- Handlers	City Carrier - Regular	City Carrier - Other	Super- visors
A/B & NDCs	.03	.03	.03	.024	.024	.04
C	.09	.09	.09	.073	.073	.10
D	.17	.17	.17	.138	.138	.10
E	.24	.24	.24	.194	.194	.16
F	.50	.50	.50	.405	.405	.40
G	.50	.50	.50	.405	.405	.50
H	.50	.50	.50	.405	.405	.50
J	.50	.50	.50	.405	.405	.50
K	.50	.50	.00	.00	.00	.00
L	.50	.50	.00	.00	.00	.00

Table 3: Number of Readings, Craft by CAG Group
Unweighted Tallies

Excludes Generated Records

Note: BF4 includes nonscheduled leave, samples not received, at lunch, etc.

CAG Group

CRAFT		A/B	C	D	E	F	G	H/J	K/L	Grand Total
1A Supervisor		16,857	4,485	1,031	1,032	621	241	91		24,358
1B Supervisor	BF4	12,230	2,860	739	705	517	233	38		17,322
2A Clerk-Reg		53,922	10,951	4,561	4,191	2,249	989	639		77,502
2B Clerk-Reg	BF4	63,109	9,976	4,034	4,127	1,989	967	573		84,775
3A Clerk-Sub		9,987	2,123	845	975	1,376	2,050	2,912	54	20,322
3B Clerk-Sub	BF4	14,664	2,385	1,048	1,292	1,693	2,930	4,460	25	28,497
4A Mail Handler		34,823	838	147	64					35,872
4B Mail Handler	BF4	46,066	873	154	50					47,143
5A Carrier-Reg		46,652	31,098	13,606	11,977	4,682	1,366	750		110,131
5B Carrier-Reg	BF4	36,498	22,777	10,299	8,944	3,311	875	542		83,246
6A Carrier-Sub		9,727	6,315	2,684	2,614	1,461	722	509		24,032
6B Carrier-Sub	BF4	8,369	4,871	2,359	2,086	1,208	903	712		20,508
Grand Total		352,904	99,552	41,507	38,057	19,107	11,276	11,226	79	573,708

C. Third Stage Sample

The third stage of selection is the instant of time, within the selected week, for which the employee is scheduled for observation. Within the selected week, a day is first selected randomly with the probability proportional to the number of employees who work that day. The selection probabilities are 15/90 for a regular working day (Monday to Friday), 11/90 for Saturday, and 4/90 for Sunday. Then, within the selected day, the employee's scheduled reading period is determined by a random selection of a two-hour interval (first, second, third, or last) over the employee's actual tour of duty. For supervisors, clerks, and mailhandlers, the probability of selection is (5/21, 5/21, 5/21, 6/21) respectively. For carriers, the probability of selection is (5/17, 5/17, 1/17, 6/17). Finally, a random time is selected within the selected interval with a probability of 1/120.

D. Cost Estimation

The IOCS cost weighting factor is derived from standard design-based weights and national level accrued quarterly cost data for the crafts eligible for IOCS sampling. The cost weighting factor is constructed so that weighted sums of IOCS data produce cost estimates consistent with trial balance accrued costs by quarter.

1. Design Based Weight

The design based weights, W_{hijk} , are developed from the sampling design:

$$W_{hijk} = \frac{1}{P_h} * \frac{1}{P_{hijk}} * \frac{1}{P_D} * \frac{1}{P_R} * \frac{1}{P_T}$$

where

P_h = n_h / N_h , the ratio of sample offices, n_h , to total offices, N_h , for CAG h

P_{hijk} = weekly sampling rate for employee k at pay location j, craft i, CAG h,

P_D = selection probability for the day of week

P_R = selection probability for the reading period

P_T = selection probability for the instant of time for observation

W_{hijk} = design based weight for employee k at pay location j, craft i, CAG h

2. Cost Weighting Factor

The cost weighting factor "COST-BASED WEIGHT" is a dollar weight. Total accrued cost for the stratum is distributed to each employee in proportion to the employee's design weight relative to the total design weight for the stratum.

$$CW_{hijk} = \frac{W_{hijk}}{\sum_j \sum_k W_{hijk}} C_{hi},$$

where

CW_{hijk} = cost-based weight for employee k at pay location j ,
craft i , CAG h , and C_{hi} = accrued cost for craft i , CAG h .

3. The Heavy/Light Weight

For computational purposes, a relative or scaled design based weight, the Heavy/Light weight, is saved on the data record and used for computing the cost weighting factor. The Heavy/Light weight is the ratio of the design weight W_{hijk} to a standard weight.³ Its value is one for regular observations, and varies for observations which were selected with probabilities different than the standard probability within a CAG/Craft group. For example, if employees in a particular CAG/Craft group are normally selected with probability 0.03, but employees in one pay location are selected with probability 0.06, then the heavy/light weight for employees in that pay location would be $\frac{1}{2}$, since weights are the reciprocals of the probabilities of selection.

As shown below, the use of this heavy/light weight rather than the design weight does not affect the value of CW_{hijk} , since the standard weight is the same for all observations within a CAG/Craft group.

Let

W_{hi}^s = the standard weight for CAG h craft i , and

$W_{hijk}^* = W_{hijk} / W_{hi}^s$ = the heavy/light weight.

Then substituting W_{hijk}^* for W_{hijk} in the formula for CW_{hijk} , above, yields

$$CW_{hijk} = \frac{W_{hijk}^*}{\sum_j \sum_k W_{hijk}^*} C_{hi} = \frac{(W_{hijk} / W_{hi}^s)}{\sum_j \sum_k (W_{hijk} / W_{hi}^s)} C_{hi} = \frac{W_{hijk}}{\sum_j \sum_k W_{hijk}} C_{hi}.$$

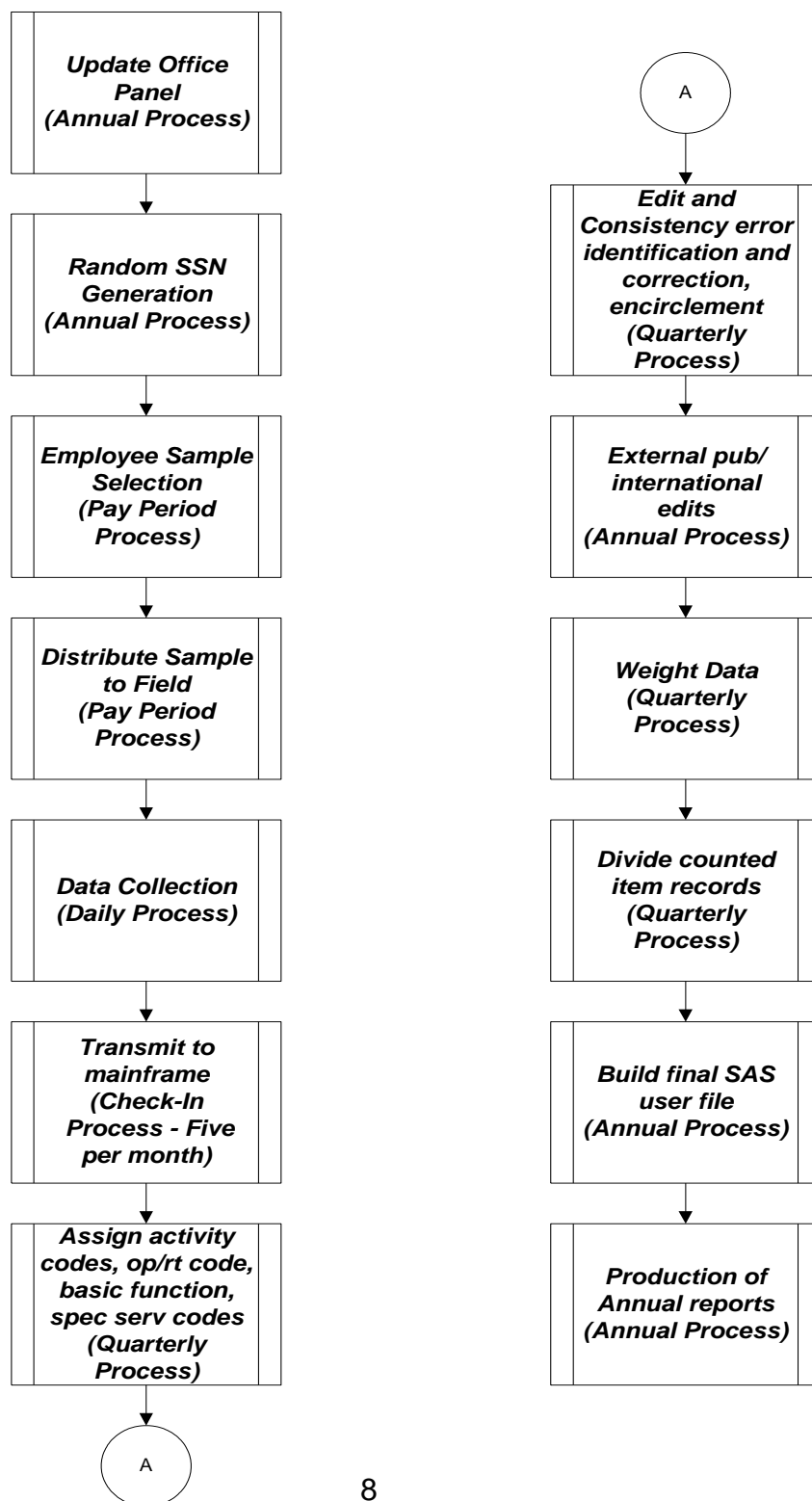
The method of estimation assumes that the sample of offices in each CAG constitutes an equal probability sample. It also assumes nonresponse is random, or independent of what is being estimated, and can therefore be regarded as constituting a simple reduction in sample size.

³ The standard weight for an observation that is tabulated in CAG x refers to the design weight of an observation sampled at a CAG x facility without pay location over-sampling, with reading number 1 or 2, and scheduled for Monday to Friday.

V. SYSTEM FLOWCHART

The IOCS processing flow consists of many processes that occur at various frequencies throughout the year. The following flowchart diagrams the order of major processing steps and their frequency within an annual processing cycle.

IOCS System Flowchart



VI. PROGRAM DOCUMENTATION

The programs that assign activity codes, basic function, operation/route codes and that perform cost estimation are documented in this section. Copies of the SAS programs and JCL are provided electronically on the accompanying CD.

ALB040 - Program

The central function of this program is to assign initial four-digit activity codes for labor activities or products and to assign up to five special service codes. In addition, it assigns initial basic function and operation/route codes.

Inputs are:

- IOCS tally data;
- Periodicals data (ISSN, Publication No.);
- ZIP Code to County mapping;
- Postal Rates;
- Barcode Service Type Code mappings.

Output is a file of IOCS tally data with activity code, basic function and operation/route codes assigned, and with coded extra services.

ALB060 - Program

The main function of this SAS program is to perform edit and consistency checking. It checks the validity of certain data and checks certain related fields within the record for consistency. Records that fail the checks are assigned an error code and written to an error file for later correction, while remaining records are written to a "clean records" file. This program is applied several times in an iterative cycle with program ALB078.

Inputs are:

- IOCS tally data, either from ALB040 or from ALB078;
- Finance numbers in the IOCS panel;
- Tables of activity codes, extra service codes, operation/route codes, and country codes.

Output consists of two files, one with tallies that are clean, and one with tallies with data inconsistencies to be resolved.

ALB078 - Program

This is a SAS error correction program. Its purpose is to resolve data inconsistencies that lead to the error codes assigned by ALB060. It is applied several times in an iterative cycle with program ALB060.

Input is the file of tallies with data inconsistencies from ALB060. Output is a file of these tallies with updates and corrections.

ALB080 - Program

This program applies encirclement rules, assigning costs to extra services when appropriate. The previous activity code of the parent piece is overwritten, replaced by the activity code of the encircled extra service.

Inputs are the files of tallies output from programs ALB060 and ALB078.

Outputs are the IOCS tallies with activity codes encircled when appropriate, in both SAS and flat files.

External review

Tallies are also reviewed externally. These checks include: validation of Periodicals titles; specialized validation of international mail checking postage, markings and barcodes; validation of data using scanned barcodes, and review of anomaly log entries.

ALB101 Program

The central purpose of this program is to produce IOCS cost weighting factors. It also merges in the results of the external international edit and the external Periodicals review, and performs corrections to some activity codes. The IOCS cost weighting factor is derived from standard design-based weights and national level accrued quarterly cost data for the crafts eligible for IOCS sampling. The cost weighting factor is constructed so that weighted sums of IOCS data produce cost estimates consistent with trial balance accrued costs by quarter.

Inputs are:

- IOCS tally files that were output from program ALB080;
- List of finance numbers with corresponding CAG/Finance group codes;
- List of finance numbers with updated CAG and weighting factors;
- Files of Post Office accrued expense data by craft and CAG;
- Periodicals tallies after external review;
- International tallies after external review;
- Edited tallies from external review of barcode scans;
- Edited tallies from external review of anomaly log;
- Sampling rate data used in sample selection for regular offices;
- Sample rate data used in sample select for heavy/light offices;
- Tallies of supervisors with automatically coded activity codes.

Outputs are:

- IOCS tally files with cost weights assigned and with edits and automatically assigned activity codes incorporated;
- File of dollar values by shape for products with mixed mail costs distributed in ALB103.

ALB103 - Program

SAS program, ALB103 is executed to 1) generate IOCS records representing counted mixed mail for counted items and 2) add detailed international activity codes.

Inputs are:

- IOCS tally file from ALB101;
- Detail data records for counted mixed mail;
- Costs by product and shape from ALB101;
- Mapping of countries to country groups.

Outputs are the IOCS tallies with additional records for counted mixed and with additional detail for international tallies. This output is in SAS and flat files.

ALB106 - Program

This program reformats and summarizes the IOCS tally data into the form required by the CARMM procedure. It also produces several craft level reports for input into CRA spreadsheets.

The summary output file drops basic function 4 records, then summarizes tallies and dollars for groups defined by CAG, Finance Grouping, craft code designation, operation/route code, basic function, and activity code.

CS2SUPV - Program

This program produces a report on split supervisor activity codes. The results are input to the C/S 2 spreadsheets.

- There are two analyses of activity code 7470 (supervision of mixed clerk/mail handler activities). The first reports on certain activities that should *not* be included—i.e., carrier activities (Q15D), other craft-level employees (Q15F), and no craft-level employees (Q15G). If none of these are found, “NO OTHERS” will be 100.0 percent. The second analysis is used to reallocate a portion of 7470 to mail processing, window, and administrative activities (Q15E1, Q15E3).
- An analysis of activity code 7635 (supervision of two or more clerk/mail handler activities) verifies that very few tallies include administrative/other activities (Q15E1) or other craft-level employees (Q15F).
- There are two analyses of activity code 7637 (supervision of clerks/mail handlers and at least one carrier). The first analysis determines the proportions of the various activities assigned to mail processing, window and admin (Q15E1, Q15E3, Q15F, Q15G). The second analysis narrows the mail processing activities to bulk mail acceptance, collection/preparation, processing/distribution, and miscellaneous (Q15E1).

CS3EQUIP - Program

This program develops distribution keys for mail processing equipment and training. The program selects all tallies for which:

- Employee is a clerk or mail handler
- Employee is assigned a direct mail activity code
- Employee is in a mail-processing related operation

The selected records are divided into types of equipment being used, type of manual operation being performed, NDC, parcels, and other mail processing activities. They are then assigned to product based on activity code, and reports are written.

ALBCARMM - Program

The function of the City **Carrier Mixed Mail** (CARMM) Cost Distribution program is to distribute mixed mail costs to direct mail activity codes and to produce a variety of summary reports as output. The inputs are: 1) cost data summarized by ALB106; 2) a table mapping direct mail activity codes to mixed mail codes.

APPENDIX A: IOCS CD-ROM CONTENTS

The associated CD-ROM contains the following.

1. Directory Data\ contains the IOCS dataset, both a PC-SAS dataset, PRCPub16.sas7bdat, and a flat file, PRCPub16Flat.dat, and a macro to read the flat file, PRCPUB_FLTFMT.txt.
2. Directory SASPrograms\ contains the SAS programs used to assign activity codes, basic function and operation/route numbers, and to estimate costs.
3. Directory JCL\ contains the JCL used to run the SAS programs.
4. Directory ALB\HQ624D01\ contains the total dollars by craft and CAG that are distributed by IOCS.
5. File IOCSDataDictionaryFY16.xls describes the variables in the IOCS data files.
6. File MASTER.CODES.FY16 is a list of codes used in IOCS.
7. File FY16.MXMAIL.DATA is the mapping of direct to mixed mail activity codes for CARM.
8. File ReadPRCPubOutput.txt is the output of a program that lists the variables in the PRCPub16 dataset and prints the contents of 10 records.
9. File IOCSDataEntryFlowchartFY16.xls is the flowchart describing the CODES software survey instrument.
10. File "IOCS CVs FY16 Public.xlsx" has the IOCS CVs.

Note: The data file contains data elements of the IOCS data file used for the development of the Fiscal Year 2016 CRA. It was developed by dropping variables not used in development of the CRA, and recoding variables containing sensitive information.

The following variables were recoded:

- Field F1 - the second character of F1 (area identifier) has been recoded.
- Field F2 - finance number has been recoded.
- Field Q01 - employee identification number has been recoded.

The public datasets have been further modified by assigning activity code x475 to all domestic competitive products and x780 to all International products, and dropping variables that could identify these products.